IS : 7651 - 1975

Indian Standard

SPECIFICATION FOR WIRE REINFORCED RUBBER COVERED HYDRAULIC HOSE

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Indian Standard

SPECIFICATION FOR WIRE REINFORCED, RUBBER COVERED HYDRAULIC HOSE

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 25 April 1975, after the draft finalized by the Rubber Products Sectional Committee had been approved by the Chemical Division Council.

0.2 This standard is essentially based on International Standard ISO 1436-1972 ' Wire reinforced, rubber covered hydraulic hose ' issued by International Organization for Standardization.

0.3 For checking the quality of the rubber used for the hose, determination of tensile strength and elongation at break both before and after accelerated ageing test was considered desirable. However, the requirements for this test could not be included at the time of finalization of this standard because of non-availability of adequate data. Investigations are now in progress and this requirement is likely to be included shortly through an amendment.

0.4 Dimensional details of widely used hoses have been given in Appendix A for information only.

0.5 This standard contains clauses **4.4.1** and **4.8** which call for agreement between the purchaser and the supplier.

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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1. SCOPE

1.1 This standard prescribes the requirements and methods for sampling and test for wire embedded hose of internal diameter from 5 to 51 mm, suitable for use with common hydraulic fluids, such as mineral oils, soluble oils, oil and water emulsions, aqueous glycol solutions, and water at temperatures ranging from — 40°C to + 100°C.

*Rules for rounding off numerical values (*revised*).

1.1.1 The hose is not suitable for use with castor oil-based and esterbased fluids.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 7503 (Part I)-1974* shall apply.

3. TYPES

3.1 This standard covers two types of hoses depending on the designed working pressure as indicated in **4.5**.

4. REQUIREMENTS

4.1 Materials

4.1.1 *Lining* — The lining shall consist of suitable rubber compound resistant to oil.

4.1.2 *Reinforcement* — The reinforcement shall be by one or more layers of high tensile steel wire. Cotton or synthetic fibre may also be used along with steel wire.

4.1.3 *Cover* — The cover shall consist of a suitable rubber compound resistant to oil and weather.

4.2 Construction

4.2.1 *Lining* — The lining shall be reasonably uniform in thickness, concentric and free from air blisters, porosity and splits. It shall be seamless and as smooth in the bore as is consistent with good manufacturing practice.

4.2.2 *Cover* — The cover shall be reasonably uniform in thickness, concentric and free from air blisters, porosity and splits.

4.2.3 *Wall Thickness* — The wall thickness at different points measured according to **4.2.2** of IS : 443-1975† shall not differ by more than the following values:

Up to and including 6·3 mm nominal bore — 0·8 mm

Over 6·3 mm but up to and including 22 mm nominal bore — 1·0 mm, and

Over 22 mm nominal bore — 1·3 mm.

4.3 Bore — The bore shall meet the requirements of Table 1.

4.4 Tolerance on Length

4.4.1 The hose shall be supplied in lengths as specified by the purchaser, subject to a tolerance on the specified lengths of ± 1 percent or ± 3 mm, whichever is the greater.

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*Glossary of terms used in the rubber industry, Part I.

†Methods of sampling and test for rubber hoses (*second revision*).

TABLE 1 PERMITTED RANGE OF BORE SIZE

(Clause 4.3)

Sl No.	Nominal Bore Size	Permitted Range	
		Minimum	Maximum
(1)	(2)	(3)	(4)
	mm	mm	mm
i)	5	4·5	5·4
ii)	6·3	6·1	6·9
iii)	8	7·7	8·5
iv)	10	9·3	10·1
v)	12·5	12·3	13·5
vi)	16	15·4	16·7
vii)	19	18·6	19·8
viii)	22	21·8	23·0
ix)	25	25·0	26·4
x)	31·5	31·3	33·0
xi)	38	37·7	39·3
xii)	51	50·4	52·0

4.4.2 When no specific lengths have been ordered, the percentages of different lengths in any given delivery shall be as follows:

Over 13 m : not less than 65 percent

7·5 to 13 m : not more than 35 percent

1 m to 7·5 m : not more than 10 percent

No lengths shall be less than 1 m.

4.5 Pressure Ratings — The design working pressure of hose shall comply with the requirements of Table 2.

4.6 Proof Pressure Test — The hose when tested according to the method prescribed in **8.3** of IS : 443-1975* shall withstand without damage, a proof test pressure of twice the design working pressure.

4.7 Minimum Bend Radius and Change in Length at Design Working Pressures

4.7.1 The hose at the design working pressure shall be capable of being bent to the radii given in Table 3.

NOTE — They should not be installed for use at these pressures using smaller bend radii.

*Methods of sampling and test for rubber hoses (*second revision*).

TABLE 2 DESIGN WORKING PRESSURE

(*Clause* 4.5)

Sl No.	Nominal Bore	Design Working Pressure	
		Type 1	Type 2
(1)	(2)	(3)	(4)
	mm	MN/m² (Approx kgf/cm²)	MN/m² (Approx kgf/cm²)
i)	5	21·0 (210)	35·0 (350)
ii)	6·3	20·0 (200)	35·0 (350)
iii)	8	17·5 (175)	30·0 (300)
iv)	10	16·0 (160)	28·0 (280)
v)	12·5	14·0 (140)	25·0 (250)
vi)	16	10·5 (105)	20·0 (200)
vii)	19	9·0 (90)	16·0 (160)
viii)	22	8·0 (80)	14·0 (140)
ix)	25	7·0 (70)	14·0 (140)
x)	31·5	4·5 (45)	11·0 (110)
xi)	38	3·5 (35)	9·0 (90)
xii)	51	2·6 (26)	8·0 (80)

4.7.2 The change in length of hose at the design working pressure shall not be greater than that specified in Table 3.

TABLE 3 BEND RADIUS AND CHANGE IN LENGTH

(*Clauses* 4.7.1 *and* 4.7.2)

Sl No.	Nominal Bore	Bend Radius	Change in Length
(1)	(2)	(3)	(4)
	mm	mm	mm
i)	5	90	+ 0, − 6
ii)	6·3	100	+ 0, − 6
iii)	8	115	+ 2, − 4
iv)	10	130	+ 2, − 4
v)	12·5	180	+ 2, − 4
vi)	16	205	+ 2, − 4
vii)	19	240	+ 2, − 4
viii)	22	280	+ 2, − 4
ix)	25	300	+ 2, − 4
x)	31·5	420	+ 2, − 4
xi)	38	500	+ 2, − 4
xii)	51	630	+ 2, − 4

4.8 Impulse Test — If agreed to between the purchaser and the supplier, the hose when tested in accordance with method indicated in **4.8.1** to **4.8.4**, shall show no leakage or malfunction. Four unaged samples, with end fittings fitted shall be tested. The maximum test pressure shall not be more than 35 MN/m² (350 kgf/cm²).

4.8.1 Internal pulsating pressure of the cycle indicated in Fig. 1 shall be employed. The rate of pulsating pressure shall be between 30 and 100 cycles per minute.

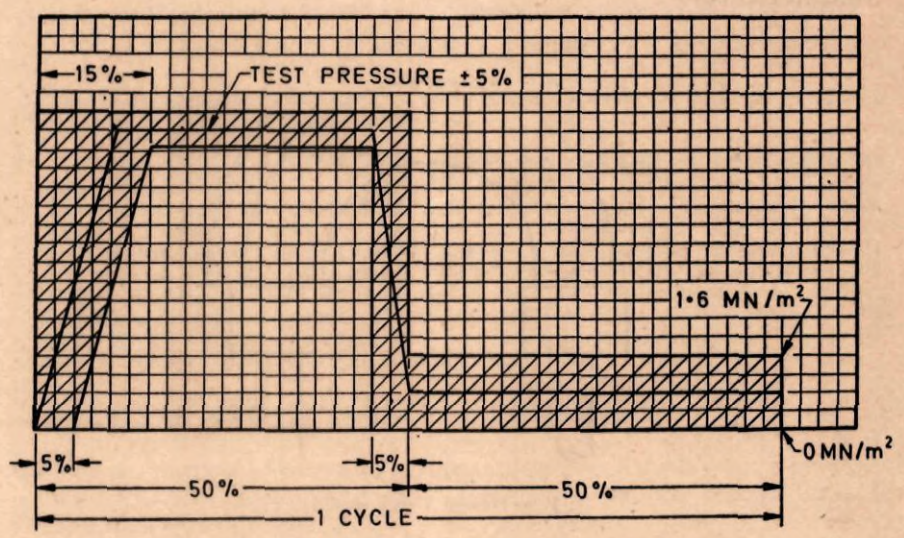


FIG. 1 PRESSURE IMPULSE CYCLES FOR HOSE

4.8.2 *Type 1* hose shall be tested at 125 percent of the working pressure for hoses of nominal bores 25 mm and smaller and 100 percent of the working pressure for nominal bore 31·5 mm and above, at a temperature of 93 ± 5°C using circulating petroleum-based test fluid, for a minimum of 150 000 impulse cycles.

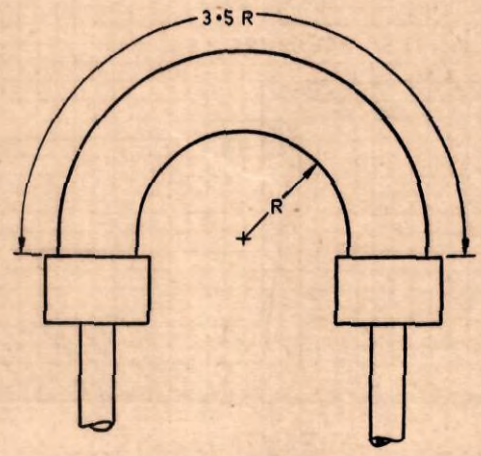
4.8.3 *Type 2* hose shall be tested at 133 percent of the working pressure, subject to maximum pressure stipulated in **4.7** at a temperature of 93 ± 5°C using circulating petroleum-based test fluid for a minimum of 200 000 impulse cycles.

NOTE 1 — Any failures adjacent to the end fittings shall be disregarded and repeat tests carried out. Failure due to coupling blow-off or rupture adjacent to the fittings (within 25 mm) shall not be interpreted as a true hose burst but as failure due to the fittings attachment and recorded as such.

NOTE 2 — The oil used in the test shall be suitable petroleum-based hydraulic fluid as agreed to between the manufacturer and the user.

NOTE 3 — The free length of the hose under test shall be 0·4 m.

4.8.4 The test piece shall be connected to the apparatus and, in the case of hoses up to and including 22 mm nominal bore, they shall be bent through 180° so that the fittings are parallel and the distance between the two ends of the hose at the fittings is twice the minimum radius ± 5 percent as shown in Fig. 2. Hose over 22 mm nominal bore shall be left in straight condition.



R = Design Bend Radius

FIG. 2 ATTACHMENT OF HOSE FOR IMPULSE TEST

4.9 Cold Flexibility — Hose or hose assembly or both shall be subjected to a temperature of − 40°C for 24 hours. After this time and while still at − 40°C, the samples shall be flexed in 4 seconds or less over a mandrel having a diameter equal to twice the minimum bend radius specified in Table 3. Hose up to and including 22 mm in diameter shall be bent through 180° over the mandrel; hose larger than 22 mm in diameter shall be bent through 90° over the mandrel.

4.9.1 After flexing, the sample shall be allowed to warm to room temperature and shall then be visually examined for cover cracks and subjected to a proof test (*see* **4.6**). There shall be no cover cracks or leakage.

4.10 Swelling in Solvent — When representative samples of rubber of lining and cover of the hose are subjected to swelling at 27 ± 1°C for

72 hours in oil No. 3 specified in IS : 3400 (Part VI)-1967*, the volume shall not increase by more than 100 percent when tested according to the method prescribed in **11** of IS : 443-1975†.

5. MARKING

5.1 Each length of hose shall be indelibly marked adjacent to each end with the following:

a) Manufacturer's name or trade-mark, if any;

b) Nominal diameter and type of hose; and

c) Month and year of manufacture, if required by the purchaser.

5.1.1 Each length of hose may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

6. SAMPLING AND CRITERIA FOR CONFORMITY

6.1 For the purpose of ascertaining the conformity of the hose in a consignment to this specification, the scale of sampling and the criteria for conformity shall be as prescribed in **3** of IS : 443-1975†.

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*Methods of test for vulcanized rubbers, Part VI Resistance to liquids.
†Methods of sampling and test for rubber hoses (*second revision*).

APPENDIX A

(*Clause* 0.4)

DIMENSIONAL DETAILS OF WIDELY USED HOSES

Sl No.	Nominal Bore	Type 1				Type 2			
		Outside Diameter Over Wire		Finished Outside Diameter		Outside Diameter Over Wire		Finished Outside Diameter	
		Min	*Max*	*Min*	*Max*	*Min*	*Max*	*Min*	*Max*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	mm	mm	mm	mm	mm	mm	mm	mm	mm
i)	5	9·0	10·0	12·0	13·5	10·5	11·7	15·0	16·8
ii)	6·3	10·5	11·7	15·0	16·8	12·1	13·3	16·8	18·3
iii)	8	12·1	13·3	16·8	18·3	13·8	15·0	18·3	19·9
iv)	10	14·5	15·76	19·0	20·6	16·0	17·2	20·6	22·2
v)	12·5	17·5	19·0	22·2	23·8	19·0	20·6	23·8	25·4
vi)	16	20·6	22·2	25·4	27·0	22·2	23·8	27·0	28·6
vii)	19	24·5	26·2	29·3	31·0	26·1	27·8	31·0	32·8
viii)	22	27·8	29·3	32·5	34·1	29·3	31·0	34·1	35·8
ix)	25	32·5	34·1	37·0	39·2	34·1	35·8	38·5	40·9
x)	31·5	39·2	41·8	44·5	47·7	43·2	45·6	49·2	52·3
xi)	38	45·5	48·0	51·0	54·0	49·8	52·0	55·5	58·8
xii)	51	59·0	61·5	64·8	68·2	62·3	64·7	68·2	71·5

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INDIAN STANDARDS

ON

RUBBER HOSES

RUBBER HOSES

IS :

443-1975	Methods of sampling and test for rubber hoses (*second revision*)
444-1968	Water hose of rubber with woven textile reinforcement (*second revision*) (superseding IS : 445-1964)
446-1968	Air hose of rubber with woven textile reinforcement (*second revision*) (*superseding* IS : 3557-1965)
447-1968	Welding hose of rubber with woven textile reinforcement (*second revision*)
635-1968	Oil and solvent resistant hose of rubber with woven textile reinforcement (*second revision*)
636-1962	Fire fighting hose (rubber lined woven jacketed) (*revised*)
911-1968	Air hose of rubber with braided textile reinforcement (*second revision*) (*superseding* IS : 912-1963)
913-1968	Water hose of rubber with braided textile reinforcement (*second revision*) (*superseding* IS : 914-1963)
1677-1968	Agricultural spray hose of rubber with braided textile reinforcement (*second revision*)
2396-1968	Rubber hose for petrol and diesel fuels with braided textile reinforcement (*first revision*)
2410-1963	Suction hose of rubber for fire services
2482-1963	Water suction hose of rubber, light, duty
2765-1964	Radiator hose
3418-1968	Oil and solvent resistant hose of rubber with braided textile reinforcement (*first revision*)
3549-1965	Water suction and discharge hose of rubber, heavy duty
3572-1968	Welding hose of rubber with braided textile reinforcement (*first revision*)
5797-1970	Electrically bonded aircraft fuelling rubber hose
5821-1970	Hot water hose of rubber with woven textile reinforcement
5894-1970	Rubber sand blast hose with braided textile reinforcement
5937-1970	Hot water hose of rubber with braided textile reinforcement
6417-1975	Rubber sand blast hose with woven textile reinforcement
7651-1975	Wire reinforced, rubber covered hydraulic hose
7654-1975	Rubber hose for chemicals